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**TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371**

NAA-CAI-P30

U.S. APPLICATION NO. (If known, see 37 C.F.R.1.5)

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INTERNATIONAL APPLICATION NO.

PCT/JP00/02664

INTERNATIONAL FILING DATE

24 April 2000

PRIORITY DATE CLAIMED

22 April 1999

TITLE OF INVENTION

METHOD AND SYSTEM FOR FILE MANAGEMENT IN DISTRIBUTED ENVIRONMENT

APPLICANT(S) FOR DO/EO/US

RYU, Tadimitsu

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
 - a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☒ has been transmitted by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
 - a. ☒ are transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☐ have not been made and will not be made.
8. ☒ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern document(s) or information included:

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A **FIRST** preliminary amendment.
☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
14. ☒ A substitute specification. *NOT RECEIVED.*
15. ☐ A change of power of attorney and/or address letter.
16. ☐ Other items or information:

10/030484

PCT/JP00/02664

17. ☒ The following fees are submitted:

BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(5)): 890.00

Search Report has been prepared by the EPO or JPO..... x\$850.00

International preliminary examination fee paid to USPTO (37 CFR 1.482)

\$660.00

No international preliminary examination fee paid to USPTO (37 CFR 1.482)

but international search fee paid to USPTO (37 CFR 1.445(a)(2)).. \$730.00

Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO..... \$980.00

International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4)..... \$92.00

ENTER APPROPRIATE BASIC FEE AMOUNT =

CALCULATIONS PTO USE ONLY

\$ 890.00

Surcharge of \$130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(e)).

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE
Total claims	15 -20 =		X \$22.00
Independent claims	2 -3 =		X \$76.00
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$240.00

TOTAL OF ABOVE CALCULATIONS =

\$ 890.00

Reduction by 1/2 for filing by small entity, if applicable. ~~Verified Small Entity Statement must also be filed (Note 37 CFR 1.491.121, 1.491.122)~~ Applicant claims small entity status

SUBTOTAL =

\$ 445.00

Processing fee of \$130.00 for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f)).

TOTAL NATIONAL FEE =

\$ 445.00

Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +

TOTAL FEES ENCLOSED =

\$ 445.00

Amount to be:

refunded \$

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a. ☒ A check in the amount of \$ 445.00 to cover the above fees is enclosed.b. ☐ Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 15-0699. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SIGNATURE:

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27,621

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
 U.S. DESIGNATED OFFICE UNDER 35 U.S.C. 371

-----: Dkt.#: NAA-CAI-P30
 In Re Patent Application Of: :
 RYU :
 Serial No.: (To Be Assigned) :
 Filed: (Concurrently Herewith) :
 Title: METHOD AND SYSTEM FOR FILE MANAGE- :
 MENT IN DISTRIBUTED ENVIRONMENT :
 -----: October 19, 2001

PRELIMINARY AMENDMENT

Commissioner of Patents
 U.S. Patent & Trademark Office
 Washington, D.C. 20231

Sir:

Pursuant to the filing of the above-identified patent application under 35 U.S.C. 371, please preliminarily amend the application as follows:

IN THE SPECIFICATION:

Please insert the following sentence after the Title: -
 -This U.S. patent application claims the priority of PCT International Application No. PCT/JP00/02664, filed on April 24, 2000 based on the priority of Japanese Patent Application No. 114404/1999, filed on April 22, 1999.--

Respectfully submitted,
ATTORNEYS FOR APPLICANT



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2025 RELEASE UNDER E.O. 14176

Specification
METHOD AND SYSTEM FOR FILE MANAGEMENT IN
DISTRIBUTED ENVIRONMENT

Technical field

This invention relates to a method and system for file management in distributed environment where a plural of terminals are connected by means of a network and information is recorded in respective memory of some terminals distributed, especially to those where user can use a file which was stored and controlled in a plural of terminals (information processors) connected by means of a network without paying his or her intention to such distributed environment.

Background of the Invention

Conventionally, the file management system in the distributed environment is the one wherein terminals, which have been distributed geographically, and logically, are connected by a network and file under control can be used by a user as like he or she accesses his or her own terminal. The management of common file between plural enterprises or the file distributed geographically in the same enterprise can be integrated as well as the efficiency improvement of the data access and the distribution of damage to the trouble are achieved.

However, the problem of the multiplication of the stored file, the problem of load balance in order not to concentrate accesses on specific terminal, and the problem of the synchronous at file update exist.

Usually, in the file management system in the distributed environment it makes an index, and when the user accesses the specific file, he or she learns by referring to the index the storage place of the file. Management system can be categorized into several ways depending on how the index is disposed in the system and is managed. There are 4 ways: a central management system in which a specific terminal concentrically stores the index; a complete multiplication system in which all terminals store the index; a no-multiplication system in which each terminal has its own index only while it has no index of another terminal at all, and a partial multiplication system in which some plural terminals store the index.

In the central management system, there are problems in the point

that concentration occurs on the specific terminal where has the index, in the point that it becomes the entire trouble due to trouble of this terminal, and in the point that all starting points of accesses become this specific terminal causing processing time to be increased.

In the complete multiplication system, there is no problem of the central management system. However, there are problems in the point that it is necessary to update the index of all terminals when there is a change in the index, causing the load of the entire system to concentrate at this time; and in the point that the amount of the index of the entire system becomes large because all terminals maintain the index of all terminals.

In the no-multiplication system, there is no problem that the entire system stops due to the trouble of the specific terminal and it only needs to change the index of its own terminal when there is an index change. However, there is a problem that the load to inquire to all other terminals occurs when the user accesses the file managed by the terminal other than its own terminal.

In the partial multiplication system, it tries of solving the problems having the trade-off relations that the above-mentioned three systems possess by balancing them. However, designing of the system is considerably difficult.

The purpose of the present invention resides in providing a file management method and a file management system which can overcome the problems such as the load concentration on the above-mentioned specific terminal, the synchronous at file update, and the access to another terminal in the past system.

Disclosure of the Invention

This invention to achieve the above-mentioned purpose is a file management method in the distributed environment where a plural of terminals are connected by means of a network and information is recorded in respective memory of some terminals distributed, said method comprising the steps of,

- 1) setting up in the individual terminal a file controller that manages files of its own terminal and controls exchange of information with the network
- 2) producing a meta-index to identify a information with respect to

said information within the network and registering storage place information of an original and its copy file(s), each of which stores said information, in a meta-index storage part of the file controller in each terminal where the information is recorded,

3) in the case where an access demand to one information is requested from one terminal by a user through the network, referring to the meta-index in the meta-index storage part of the file controller at said one terminal, and

- (i) when the file storing said information exists in said one terminal, opening said file in the terminal,
- (ii) when the file storing said information does not exist in said one terminal,
 - a> copying the file of another terminal on said one terminal, writing a storage place information in the meta-index of the file controller in said one terminal and other concerned terminal(s), and opening the copied file,
 - b> opening the file in another terminal and transmitting the information of the opened file to the user of said one terminal through the network., or,
 - c> transferring the file of another terminal to said one terminal, rewriting the storage place information of the meta-index, and opening the transferred file, and,

4) in the case where there is a change in the file recorded in one terminal, referring to the meta-index of said file recorded in the storage place information part of said one terminal, and updating in synchronization the file in all other terminal(s) concerned the storage place(s) of which is(are) recorded.

The invention set forth in claim 2 relates to a file management method according to claim 1 being characterized in that, the storage place information is composed of a terminal key which specifies the terminal storing the file and an address where position in memory controlled by the file controller in said terminal is specified.

The invention set forth in claim 3 relates to a file management method according to claim 1 being characterized in that, where the user of said one terminal desires to use a plural of the files discretely stored in the memory of its own terminal at the same time,

1) producing an intermediate file at new area in said memory of its own terminal by copying said files continuously, while registering a storage place information of said intermediate file in the meta-index of each file

2) referring to the meta-index and opening the intermediate file when an access demand for one of the files is requested by said user of said one terminal thereafter.

As a result, the frequency of the memory access in its own terminal is suppressed to decrease the load.

The invention set forth in claim 4 relates to a file management method according to claim 1 being characterized in that, it further includes steps of,

providing the meta-index storage part of the each terminal with a table which counts access frequency to storage place registered therein, and

copying, transferring or deleting the file depending on load balance between the terminals, if necessary.

As a result, the load between terminals is balanced and the access concentration on a specific terminal can be evaded.

The invention set forth in claim 5 relates to a file management method according to claim 1 being characterized in that, it further includes steps of,

providing the file controller with a list that describes the reference authority to each terminal, and

in the case where the file is copied on a terminal having no reference authority according to the necessary of the load balance, setting to said terminal a condition in which the copied file cannot be opened at said terminal.

The invention set forth in claim 6 relates to a file management method according to claim 1 being characterized in that,

said file comprises at least one selected from a group consisting of data files and program files.

The invention set forth in claim 7 relates to a file management method according to claim 1 being characterized in that, when a trouble is occurred in any of the terminals connected by the network, it further includes steps of,

referring to the meta-index, and,

copying the information file stored in said troubled terminal from

other terminal without trouble thereby conducting backup processing.

As a result, the safety of the system is kept even if there is a copy in the terminal without the reference authority for the load balance.

The second aspect of the present invention relates to a file management system in distributed environment where a plural of terminals are connected by means of a network and information is recorded in respective memory of some terminals distributed, each terminal comprises a file controller that manages files of its own terminal and controls exchange of information with the network is set up in the individual terminal, said file controller includes,

1) a meta-index storage part for registering a meta-index to identify a information with respect to said information within the network and registering storage place information of an original and its copy file(s), each of which stores said information, ,

2) an information transmission means for, in the case where an access demand to one information is requested from one terminal by a user through the network, referring to the meta-index in the meta-index storage part of the file controller at said one terminal, and

(iii) when the file storing said information exists in said one terminal, opening said file in the terminal,

(iv) when the file storing said information does not exist in said one terminal,

a> copying the file of another terminal on said one terminal, writing a storage place information in the meta-index of the file controller in said one terminal and other concerned terminal(s), and opening the copied file,

b> opening the file in another terminal and transmitting the information of the opened file to the user of said one terminal through the network., or,

c> transferring the file of another terminal to said one terminal, rewriting the storage place information of the meta-index, and opening the transferred file, and,

4) synchronous means for, in the case where there is a change in the file recorded in one terminal, referring to the meta-index of said file recorded in the storage place information part of said one terminal, and updating in synchronization the file in all other terminal(s) concerned the

storage place(s) of which is(are) recorded.

The invention set forth in claim 9 relates to a file management system according to claim 8 being characterized in that, it further includes,

group setting means for setting a group that makes the terminals belonging to said group possess the meta-index commonly.

The invention set forth in claim 10 relates to a file management system according to claim 8 being characterized in that, the storage place information is composed of a terminal key which specifies the terminal storing the file and an address where position in memory controlled by the file controller in said terminal is specified.

The invention set forth in claim 11 relates to a file management system according to claim 8 being characterized in that, it further includes,

speed-up means for, where the user of said one terminal desires to use a plural of the files discretely stored in the memory of its own terminal at the same time,

1) producing an intermediate file at new area in said memory of its own terminal by copying said files continuously, while registering a storage place information of said intermediate file in the meta-index of each file, and

2) referring to the meta-index and opening the intermediate file when an access demand for one of the files is requested by said user of said one terminal thereafter.

The invention set forth in claim 12 relates to a file management system according to claim 8 being characterized in that, the file controller of said each terminal further includes,

a table which counts access frequency to storage place registered therein, and

balancing means for copying, transferring or deleting the file depending on load balance between the terminals, if necessary.

The invention set forth in claim 13 relates to a file management system according to claim 12 being characterized in that, the file controller further includes,

a list that describes the reference authority to each terminal, and

said balancing means, in the case where the file is copied on a terminal having no reference authority according to the necessary of the load balance, being setting to said terminal a condition in which the copied file cannot be opened at said terminal.

The invention set forth in claim 14 relates to a file management system according to claim 8 being characterized in that,

said file comprises at least one selected from a group consisting of data files and program files.

The invention set forth in claim 15 relates to a file management system according to claim 8 being characterized in that, when a trouble is occurred in any of the terminals connected by the network, it further includes,

backup proceeding means for referring to the meta-index, and copying the information file stored in said troubled terminal from other terminal without trouble thereby conducting backup processing.

Brief Explanation of Drawings

Figure 1 is a concept chart of an embodiment according to the present invention.

Figure 2 is a block chart showing the composition of the file controller.

Figure 3 is an explanation chart showing an appearance where "Material 1" is stored.

Figure 4 is an explanation chart showing the storage after file update.

Figure 5 is an explanation chart showing an appearance of the Meta-index update.

Figure 6 is an explanation chart showing the state in the memory.

Figure 7 is an explanation chart showing the frequency table.

Figure 8 is an outline chart showing the principle of speed-up.

The Best Mode for Carrying Out The Invention

The followings are detailed explanation of an embodiment of a file management method and system according to the present invention with referring to the drawings.

Figure 1 is a concept chart of an embodiment according to the present invention. Terminals 102,103,104 connected by means of a network 101 are under the control of each operation system (Hereafter, it is said "OS"). An individual terminal equipped with a file controller 105(Hereafter, it is said "OFC") makes these three OS a capsule as a whole. Any file stored in the terminal cannot be opened by a user through any terminal unless such access has done through the file controller.

Figure 2 is a block chart showing the composition of the file controller. Reference number 201 is a meta-index data base DB, and is composed of a meta-data-index or a meta-index storage part 202 and a frequency table 203. Information transmission means 210, synchronous means 204, own terminal speed-up means 205, balance means 206, speed-up means 207, and group making means 208 control the file through the OS of each terminal, referring to the meta-index DB.

Working of information transmission means 210 will be explained. In the case where an access demand to one information is requested from one terminal by a user through the network, the information transmission means 210 in said one terminal refers to the meta-index in the meta-index storage part 202 of its own file controller. Then the file will be opened through either way of the followings and information of said opened file is transmitted to said user through the network 101. The way of opening the file is, (i) when the file storing said information exists in said one terminal, to open said file in its own terminal with taking precedent to other operations. (ii) When the file storing said information does not exist in said one terminal, the way of opening the file is

a> to copy the file of another terminal on said one terminal, to write a storage place information in the meta-index of the file controller in said one terminal and other concerned terminal(s), and to open the copied file,

b> to open the file in another terminal and transmit the information of the opened file to the user of said one terminal through the network., or,

c> to transfer the file of another terminal to said one terminal, to rewrite the storage place information of the meta-index, and to open the transferred file.

In the case of a>, the information concerned is recorded in both memories in another terminal copied therefrom and said one terminal. In this case, because the terminal storing said information comes to increase, such storage place information is written in the meta-index storage part of the file controller in its own and other terminal(s) concerned.

In the case of b>, the file of another terminal is opened without copying onto the memory of its own terminal, and said information is transmitted to the above-mentioned user. For instance, when access demands to said information are requested five times, the above-mentioned

a> or c> described later can be ruled to adopt.

In the case of c>, said file in another terminal does not exist any more because it is transferred to said one terminal. In this case, because the terminal recording said information is changed, such storage place information is written in the meta-index storage part of the file controller in its own terminal. On the other hand, such storage place information is deleted from the meta-index storage part of the file controller in other terminal(s)

Working of synchronous means 204 is explained. Figure 3 shows the appearance where "MATERIAL 1" which is the same information is stored in a terminal 1 of 301 and a terminal 2 of 302. "MATERIAL 1" is stored in an address B1 in the terminal 1 and an address B2 in the terminal 2. These addresses are the addresses in the memory given by the OS (operation system) of each terminal. Here, a meta-index R of the material 1 can be expressed as shown in the reference number 303. T1 and T2 are terminal keys to the terminal 1 and the terminal 2.

At this time, when the access demand is requested to "MATERIAL 1" by a user in the terminal 1 and the file of T1·B1 is updated, the file controller updates the file of the T2·B2 registered in R1 (the meta-index of "MATERIAL 1" in the terminal 1) with referring to R1. The address of the file updated at this time is registered and the bit of the absence (OFF) is set up and disregarded for the old file. Figure 4 shows the updated file and the old file to be OFF. Thus, the synchronous of two or more files that exist in the distributed environment can be taken.

Next, the own terminal speed-up means 205 is explained. A reference number 501 of Figures 5 is a meta-index data of information stored in the terminal 1. Information R1, R10, and R100 are registered in terminal keys and addresses (address numbers and sizes in the memory). Here, if an intermediate file R5000 of size 80 is made for an address T1-900, the memory becomes shown as in Figure 6 while the meta-index is updated as 510. The speed-up in the own terminal can be achieved by doing so. Moreover, even if any of R1, R2, and R3 is updated, they can be synchronized by referring to the meta-index data without contradiction.

The balance means 206 is explained. The frequency how many times the access demands from a specific terminal are requested regarding the respective information (Rk) is stored in the frequency tables 203. As for the

frequency table shown in Figure 7, the access frequency of each terminal (T1,T2,T3) is counted when there is an access demand for information R1. The information R1 exists in all terminals, and if the load of R1 is a problem, the file of the terminal 1 where the use frequency is the smallest is deleted. Moreover, it is moved to the terminal 3 of the highest frequency if the substance of the information exists only in the terminal 1. The load balance can be taken with referring to the frequency table like this.

The speed-up means 207 is explained. In the case in which an access demand from a user to information R7 is requested in terminal T7, the meta-index is referred. Whenever the file storing said information exists in the own terminal, the file in the own terminal is always opened. In the case without the file (801 of Figures 8), the file of another terminal is copied onto the own terminal and storage place information is written in the meta-index. A reference number 802 of Figures 8 shows the state after the file is copied. Thus, the speedup can be achieved by accessing the file copied onto the own terminal.

The group making means 208 is explained. Processing by which a target terminal (Tn) for the file control of this invention is newly added is done here. The meta-index of Tn is merged with the meta-index data of the terminals which have already been made into a group and the made data is copied onto each terminal of the group as a meta-index data of a new group. By doing like this, even if the access is done from any terminal in the group, the user can operate to treat the file as if it exists in the own terminal.

Moreover, if the reference authority(s) to each terminal is(are) registered in the meta-index DB, it is possible to let the terminal having no reference authority not to refer to the file stored in itself even if the file of the information is copied onto said terminal for the load balance, and the security of the network can be maintained.

Furthermore, in the case where the trouble occurs in any of the terminals connected by the network, the storage place information on the file stored in the trouble terminal is retrieved by referring to the meta-index. Afterwards, the backup processing is done with the copy from other terminal without any trouble. The user can maintain a safe distributed environment by doing like this without considering special backup processing or the security processing.

As described in the above explanation, according to the present

invention, the user can operate the file preserved in the distributed environment on the network as if it exists in the own terminal. Furthermore, a problem that load concentrates on a specific terminal, a problem of the synchronization at file update, and a cost increase problem because the access is made to another terminal can be evaded.

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What is claimed is:

1. A file management method in the distributed environment where a plural of terminals are connected by means of a network and information is recorded in respective memory of some terminals distributed, said method comprising the steps of,
 - 1) setting up in the individual terminal a file controller that manages files of its own terminal and controls exchange of information with the network
 - 2) producing a meta-index to identify a information with respect to said information within the network and registering storage place information of an original and its copy file(s), each of which stores said information, in a meta-index storage part of the file controller in each terminal where the information is recorded,
 - 3) in the case where an access demand to one information is requested from one terminal by a user through the network, referring to the meta-index in the meta-index storage part of the file controller at said one terminal, and
 - (i) when the file storing said information exists in said one terminal, opening said file in the terminal,
 - (ii) when the file storing said information does not exist in said one terminal,
 - a> copying the file of another terminal on said one terminal, writing a storage place information in the meta-index of the file controller in said one terminal and other concerned terminal(s), and opening the copied file,
 - b> opening the file in another terminal and transmitting the information of the opened file to the user of said one terminal through the network., or,
 - d> transferring the file of another terminal to said one terminal, rewriting the storage place information of the meta-index, and opening the transferred file, and,
 - 4) in the case where there is a change in the file recorded in one terminal, referring to the meta-index of said file recorded in the storage place information part of said one terminal, and updating in synchronization the file in all other terminal(s) concerned the storage place(s) of which is(are) recorded.

2. A file management method according to claim 1 being characterized in that, the storage place information is composed of a terminal key which specifies the terminal storing the file and an address where position in memory controlled by the file controller in said terminal is specified.

3. A file management method according to claim 1 being characterized in that, it further includes steps of, where the user of said one terminal desires to use a plural of the files discretely stored in the memory of its own terminal at the same time,

1) producing an intermediate file at new area in said memory of its own terminal by copying said files continuously, while registering a storage place information of said intermediate file in the meta-index of each file

2) referring to the meta-index and opening the intermediate file when an access demand for one of the files is requested by said user of said one terminal thereafter.

4. A file management method according to claim 1 being characterized in that, it further includes steps of,

providing the meta-index storage part of the each terminal with a table which counts access frequency to storage place registered therein, and

copying, transferring or deleting the file depending on load balance between the terminals, if necessary.

5. A file management method according to claim 1 being characterized in that, it further includes steps of,

providing the file controller with a list that describes the reference authority to each terminal, and

in the case where the file is copied on a terminal having no reference authority according to the necessary of the load balance, setting to said terminal a condition in which the copied file cannot be opened at said terminal.

6. A file management method according to claim 1 being characterized in that,

said file comprises at least one selected from a group consisting of data files and program files.

7. A file management method according to claim 1 being characterized in that, when a trouble is occurred in any of the terminals connected by the network, it further includes steps of,

referring to the meta-index, and,

copying the information file stored in said troubled terminal from other terminal without trouble thereby conducting backup processing.

8. A file management system in distributed environment where a plural of terminals are connected by means of a network and information is recorded in respective memory of some terminals distributed, each terminal comprises a file controller that manages files of its own terminal and controls exchange of information with the network is set up in the individual terminal, said file controller includes,

1) a meta-index storage part for registering a meta-index to identify a information with respect to said information within the network and registering storage place information of an original and its copy file(s), each of which stores said information, ,

2) an information transmission means for, in the case where an access demand to one information is requested from one terminal by a user through the network, referring to the meta-index in the meta-index storage part of the file controller at said one terminal, and

- (i) when the file storing said information exists in said one terminal, opening said file in the terminal,
- (ii) when the file storing said information does not exist in said one terminal,

a> copying the file of another terminal on said one terminal, writing a storage place information in the meta-index of the file controller in said one terminal and other concerned terminal(s), and opening the copied file,

b> opening the file in another terminal and transmitting the information of the opened file to the user of said one terminal through the network., or,

c> transferring the file of another terminal to said one terminal, rewriting the storage place information of the meta-index, and opening the transferred file, and,

3) synchronous means for, in the case where there is a change in the file recorded in one terminal, referring to the meta-index of said file recorded in the storage place information part of said one terminal, and updating in synchronization the file in all other terminal(s) concerned the storage place(s) of which is(are) recorded.

9. A file management system according to claim 8 being characterized

in that, it further includes,

group setting means for setting a group that makes the terminals belonging to said group possess the meta-index commonly.

10. A file management system according to claim 8 being characterized in that, the storage place information is composed of a terminal key which specifies the terminal storing the file and an address where position in memory controlled by the file controller in said terminal is specified.

11. A file management system according to claim 8 being characterized in that, it further includes,

speed-up means for, where the user of said one terminal desires to use a plural of the files discretely stored in the memory of its own terminal at the same time,

1) producing an intermediate file at new area in said memory of its own terminal by copying said files continuously, while registering a storage place information of said intermediate file in the meta-index of each file, and

2) referring to the meta-index and opening the intermediate file when an access demand for one of the files is requested by said user of said one terminal thereafter.

12. A file management system according to claim 8 being characterized in that, the file controller of said each terminal further includes,

a table which counts access frequency to storage place registered therein, and

balancing means for copying, transferring or deleting the file depending on load balance between the terminals, if necessary.

13. A file management system according to claim 12 being characterized in that, the file controller further includes,

a list that describes the reference authority to each terminal, and

said balancing means, in the case where the file is copied on a terminal having no reference authority according to the necessity of the load balance, being setting to said terminal a condition in which the copied file cannot be opened at said terminal.

14. A file management system according to claim 8 being characterized in that,

said file comprises at least one selected from a group consisting of data files and program files.

15. A file management system according to claim 8 being characterized

in that, when a trouble is occurred in any of the terminals connected by the network, it further includes,

backup proceeding means for referring to the meta-index, and copying the information file stored in said troubled terminal from other terminal without trouble thereby conducting backup processing.

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Abstract

In the file management system in the distributed environment, each terminal is equipped with file controllers 105, 200 which manage files stored therein and control the exchange of information with the network.

File controller 200 includes,

1) a meta-index storage part 202 for registering a meta-index having storage place information of an original and its copy file(s), each of which stores said information, ,

2) an information transmission means 210 for, in the case where an access demand to one information is requested from a user, referring to the meta-index, and

- (i) when the file exists in said one terminal, opening said file,
- (ii) when the file does not exist, copying the file of another terminal on said one terminal, writing a storage place information the terminals concerned, and opening the copied file etc, and transmitting the information of the opened file to the user, and,

3) synchronous means 204 for, when there is a change in the file, referring to the meta-index, and updating in synchronization the file in all other terminal(s) concerned the storage place(s) of which is(are) recorded.

A problem that load concentrates on a specific terminal, a problem of the synchronization at file update, and a cost increase problem because the access is made to another terminal can be evaded.

Figure 1

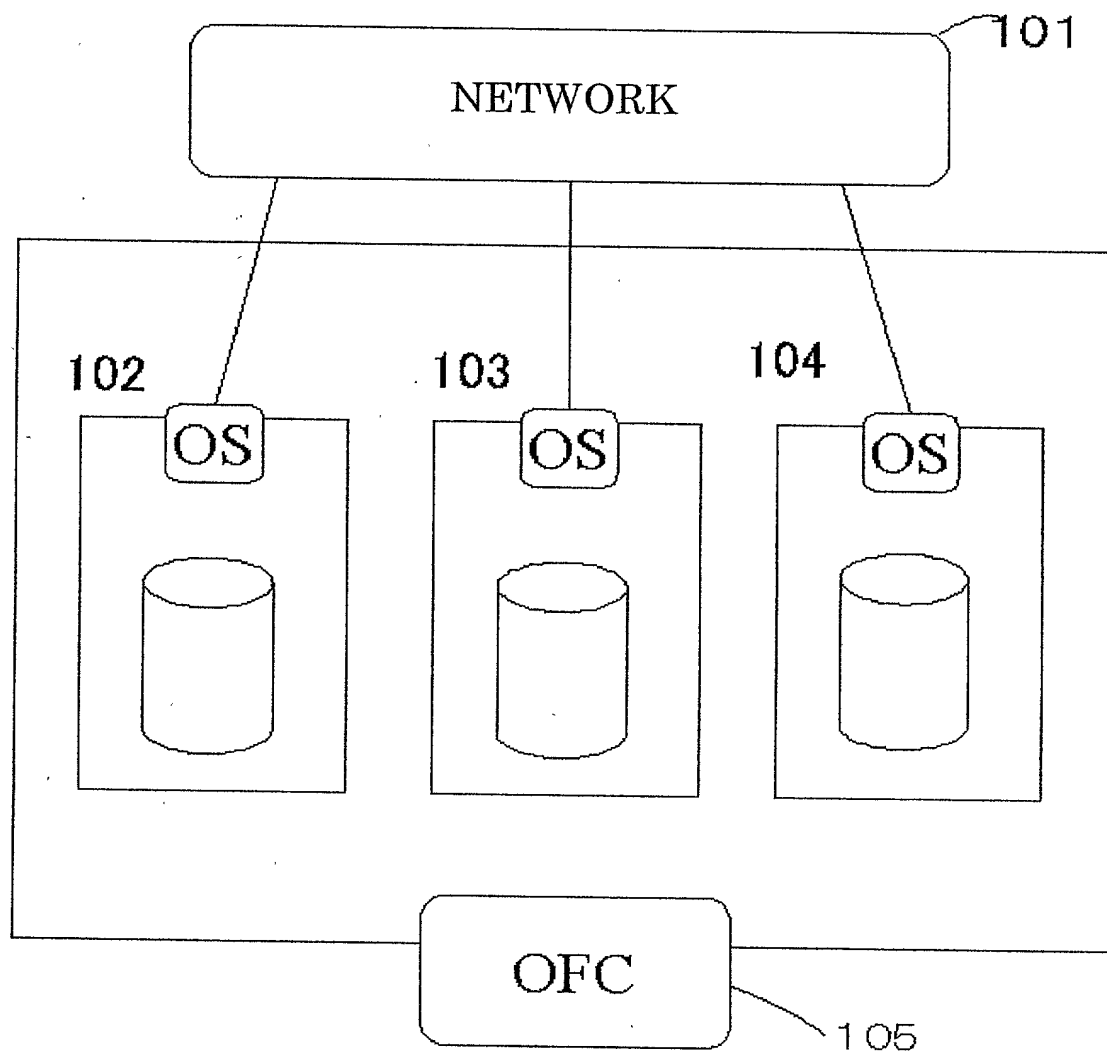


Figure 2

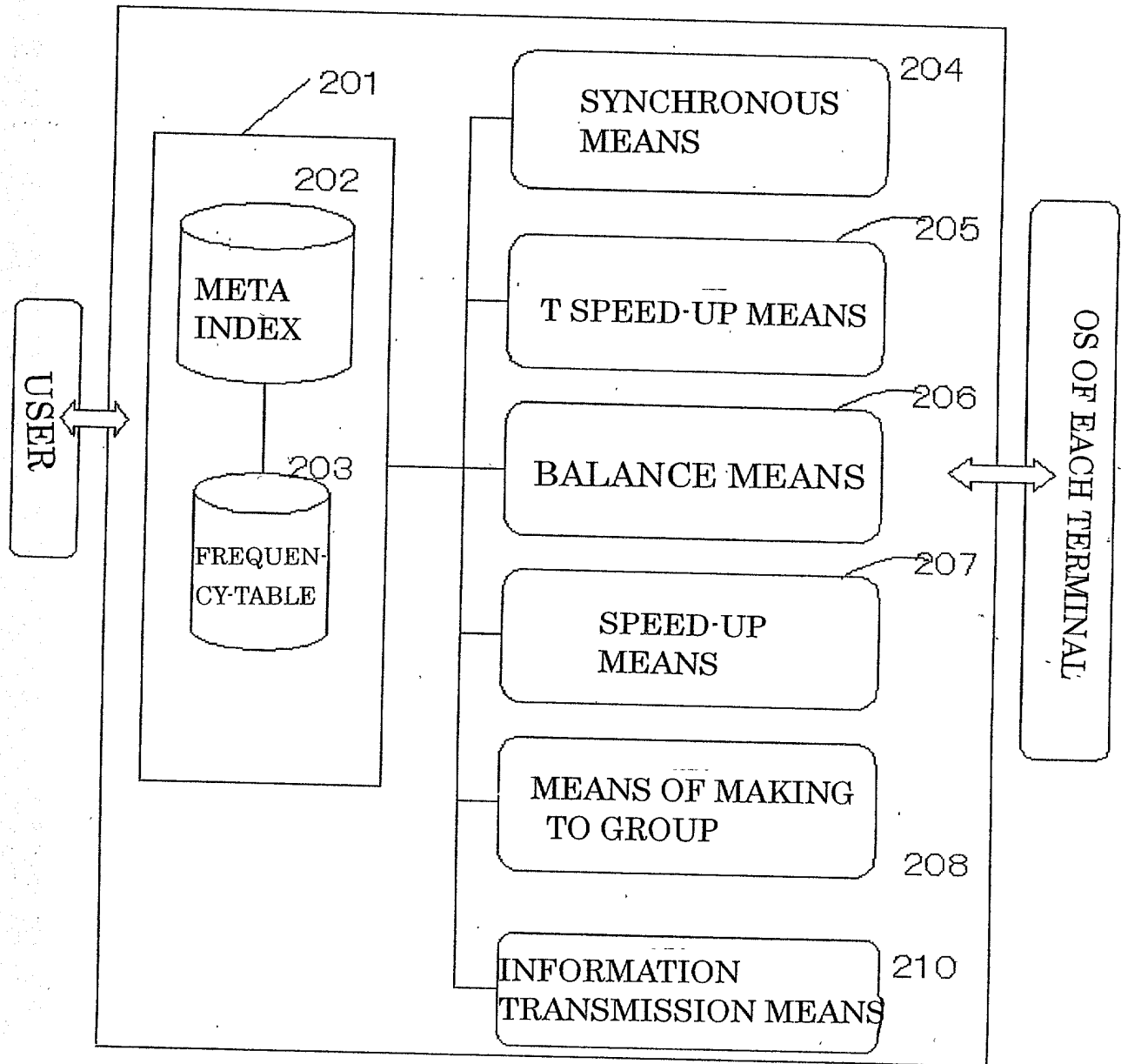


Figure 3

R: META INDEX

T: TERMINAL KEY

B: POSITION IN MEMORY (ADDRESS)

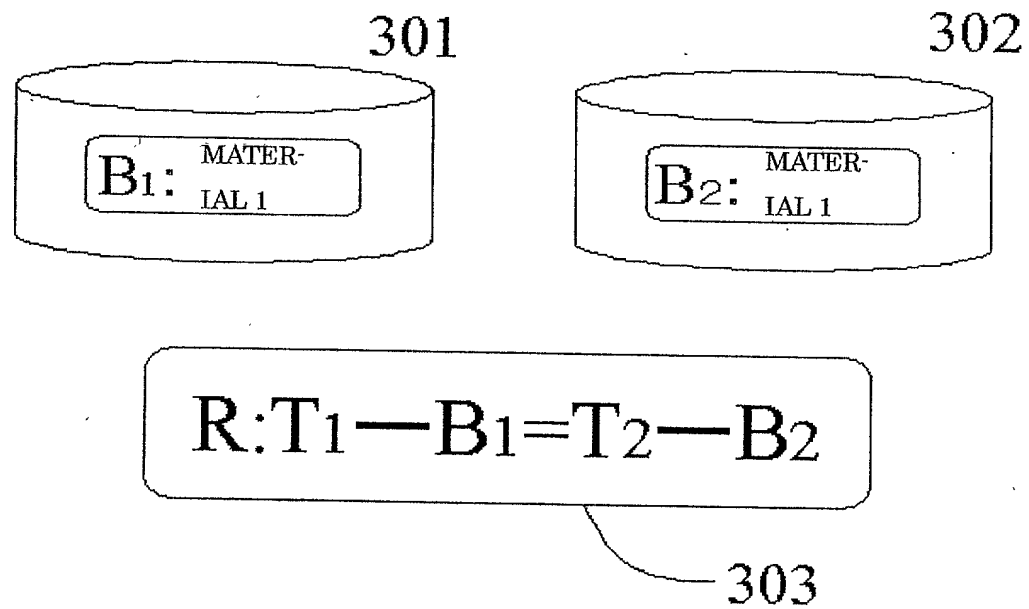


Figure 4

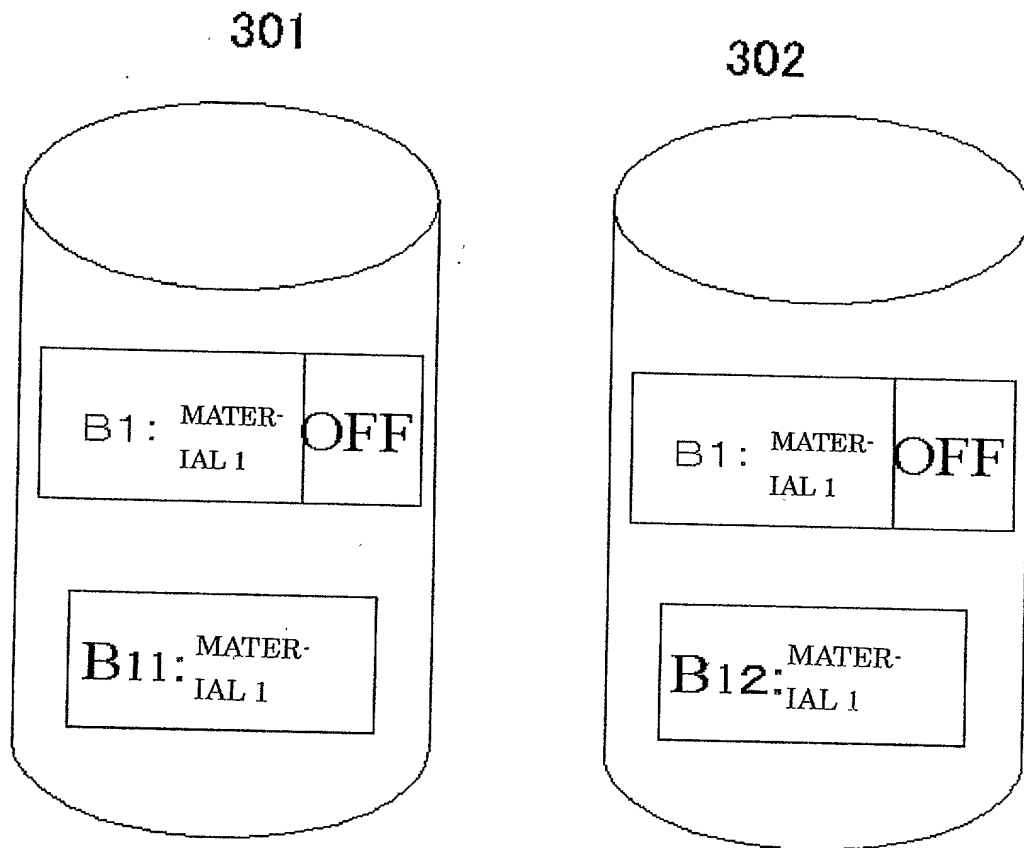


Figure 5

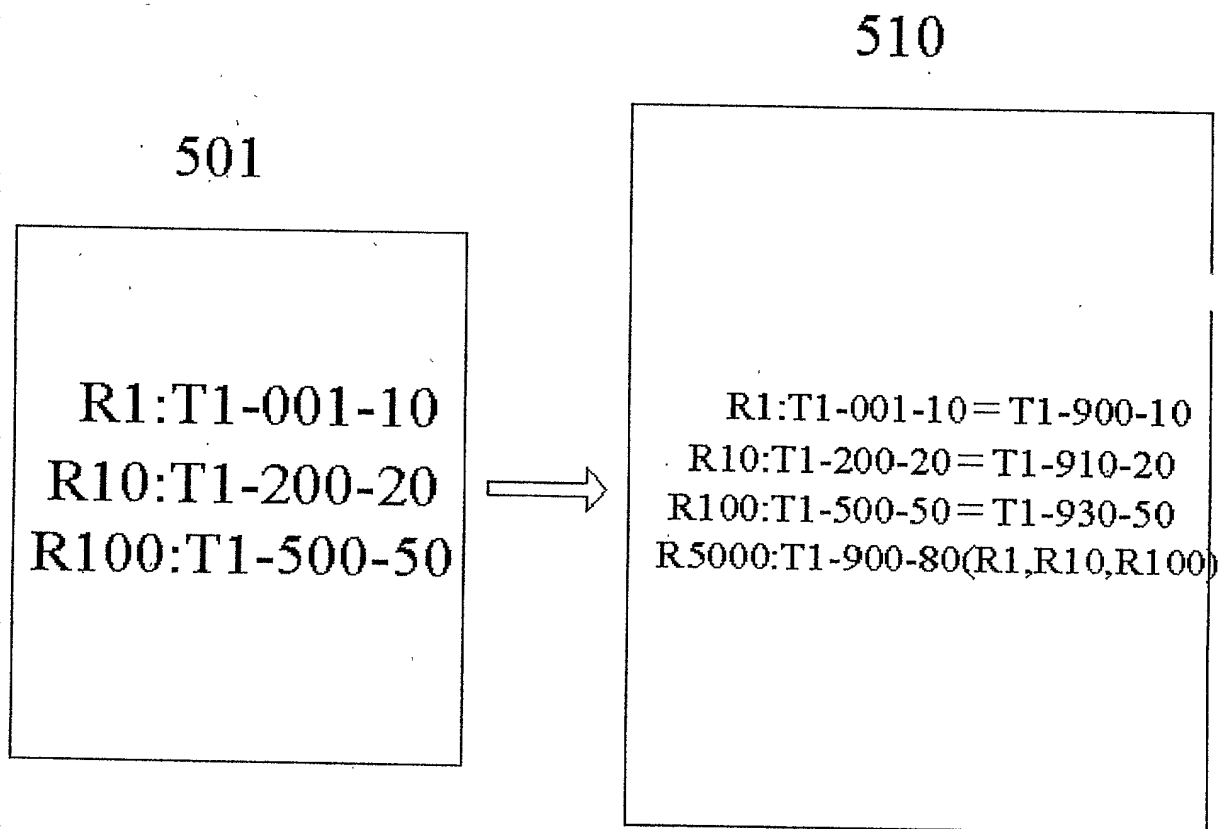
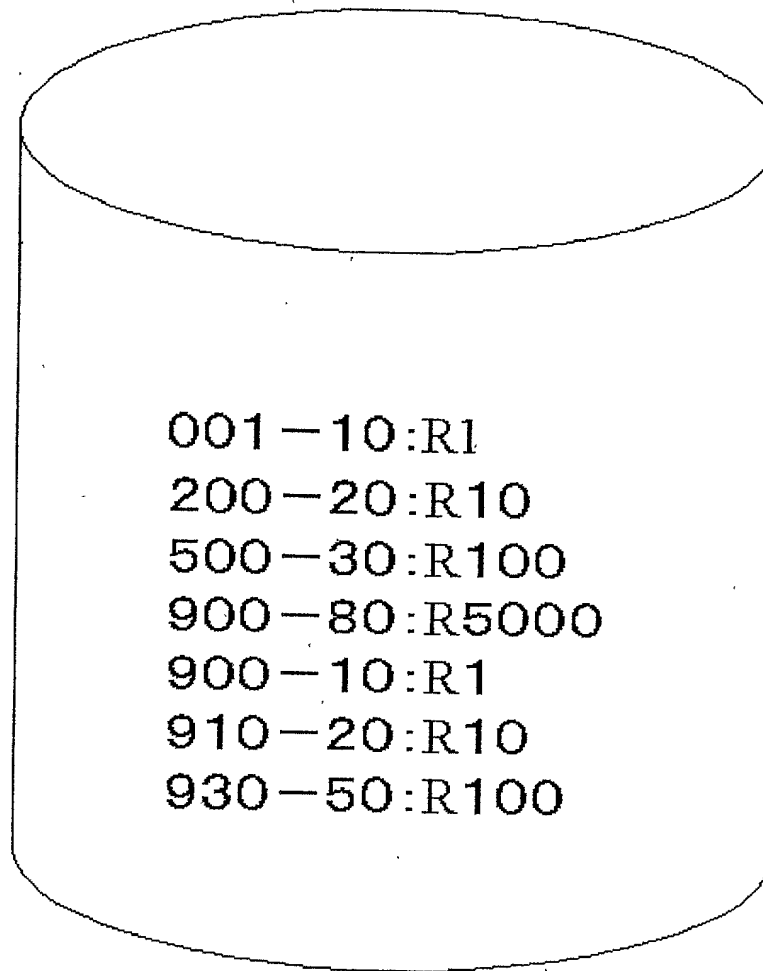


Figure 6



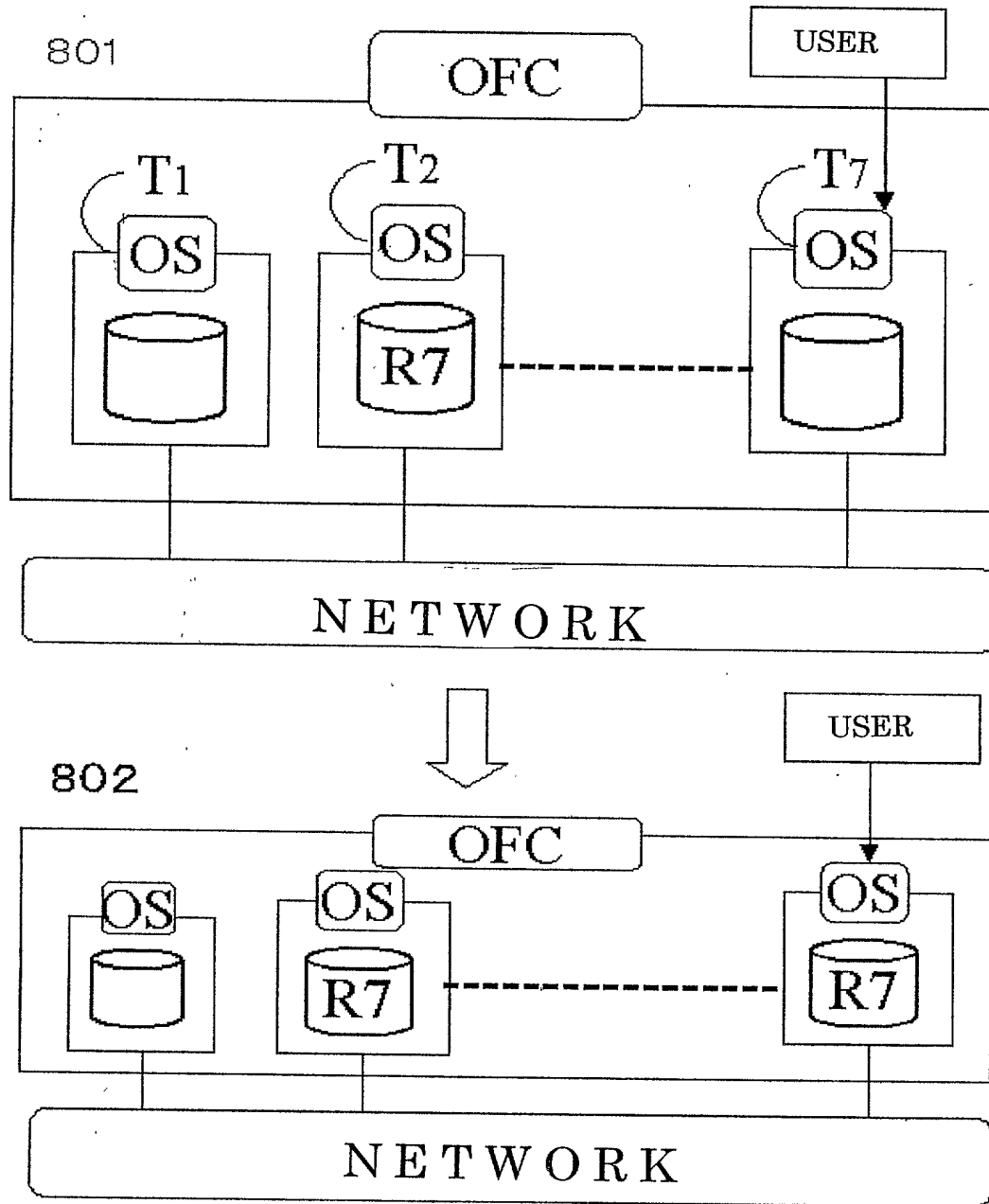
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Figure 7

	T1	T2	T3
R1	5	10	100

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Figure 8



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Atty Dkt #: NAA-CAI-P30

DECLARATION FOR U.S. PATENT APPLICATION & POWER OF ATTORNEY

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below), or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a United States patent is sought on the invention entitled:

METHOD AND SYSTEM FOR FILE MANAGEMENT IN DISTRIBUTED ENVIRONMENT

the specification of which is attached hereto, unless the following box is checked:

[X] was filed on 24 April, 2000, as U.S. Patent Application _____, or PCT International Application PCT/JP00/02664, and was amended on May 21, 2001 (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, and as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim the benefit under Title 35, United States Code, Section 119 of any foreign application(s) for patent or inventor's certificate listed below, and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s):

Priority Claimed

<u>114404/1999</u> ✓ (Appln. #)	<u>Japan</u> ✓ (Country)	<u>22 April 1999</u> ✓ (Day/Month/Year Filed)	[x] [] Yes No
_____ (Appln. #)	_____ (Country)	_____ (Day/Month/Year Filed)	[] [] Yes No
_____ (Appln. #)	_____ (Country)	_____ (Day/Month/Year Filed)	[] [] Yes No

I hereby claim the benefit under Title 35, United States Code, Sections 119(e) and 120 of any United States patent application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

(Appln. #)	(Day/Month/Year Filed)	(Status: patented, pending, abandoned)
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(Appln. #)	(Day/Month/Year Filed)	(Status: patented, pending, abandoned)
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I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the U.S. Patent and Trademark Office connected therewith: Glenn F. Ostrager, Reg. No. 29,963; Leighton K. Chong, Reg. No. 27,621; Dennis M. Flaherty, Reg. No. 31,159; Dara L. Onofrio, Reg. No. 34,889; Joshua S. Broitman, Reg. No. 38,006; Manette Dennis, Reg. No. 30,623.

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Dated: 17, Oct, 2001

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